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Power System Deregulation

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Given the difficulties encountered by the state of California in deregulating their electric power industry, many people are questioning the wisdom of such a move. To better understand the motivation behind deregulation, we need to look at the cost of energy nationwide in the United States. For example, consider some of the regional energy costs from August 2001:

Consumers in Texas were paying $41.50 per MWhour whereas power in Arizona was going for a high of $49.50 per MWhour. On the same day, Chicagoans were purchasing their power for a mere $28.00 per MWhour <www.enerfax.com, 27 August 2001>.

The difference in energy costs from one region to another is what is fueling the move towards deregulation. Consumers want access to the cheapest energy sources wherever they are located.

Traditionally, electricity customers have been a captive market: customers had to purchase power from their regional utility at its set rate. In return, the regional utility had an obligation to serve those customers with the most reliable electricity technologically possible. Electricity was produced and distributed regionally with consumers paying the regional rate.

Consumers lucky enough to be near large hydroelectric plants typically paid the least amount. Consumers living in areas that relied on natural gas or coal generation frequently paid two to three times the hydroelectric rate. Utilities tended to be conservative and took few risks that might endanger their ability to serve their customers. New products and system expansions were planned years in advance. This approach to business led to a very reliable, but somewhat costly, supply of electricity.

After many of the major industries, such as banking, shipping and long-distance telephone, started to deregulate, it was only a matter of time before attention turned to electricity. Electric power utilities have often been considered a natural monopoly. Unlike long-distance carriers that can use individual microwave towers or satellites, it is extremely costly to have more than one set of transmission lines. Because electricity serves "the greater good," utilities had long acted as benevolent monopolies under the watchful eye of public utilities commissions.

This arrangement worked very well for many years during the explosive expansion after WWII when fuel was cheap and reliability was the biggest problem. However, in the 1970s when fuel prices started showing signs of volatility, the public's eye turned towards ways of producing cheaper electricity. In 1978, the Public Utilities Regulatory Policy Act (PURPA) was passed. It promoted, among other things, energy conservation and alternate energy. This allowed non-utility generators (NUGS) access to the transmission system. This act also required utility companies to purchase power from the non-utility generators at marginal cost.

PURPA was followed by the 1992 Energy Policy Act (EPA92) that promoted energy efficiency, the use of alternate fuels, and provided broader access to the existing transmission system. Then in 1996, the Federal Energy Regulatory Commission (FERC) issued a series of policy changes that created the opening to deregulate. These new policies required utilities to separate the transmission of electricity from the business of generation. The intent of this move was to encourage transmission providers to "shop around" for the cheapest electricity and, thus, to initiate competition and technological innovation among utilities. Unfortunately, the process of deregulation has not always been a smooth path for a variety of reasons.

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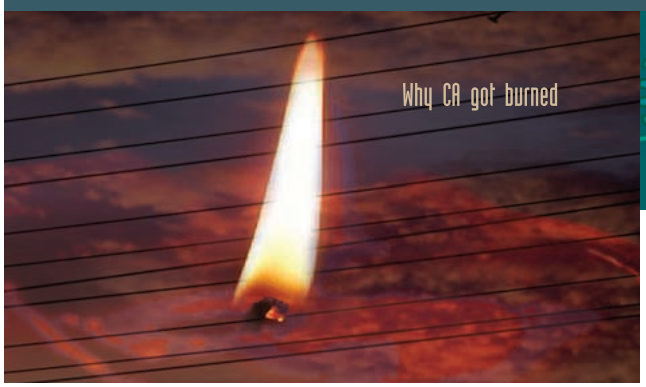

Unlike many commodities such as gas, electricity cannot be easily stored—it must be produced at the moment of need. Not only must the ability to *generate* the electricity exist, the ability to *transmit* it from the point of generation to the consumption point must also exist. Although cheap generation resources may exist, if the electric power cannot be transmitted to the demand site, the customer does not benefit from the lower prices. Or conversely, since power cannot be stored, unscrupulous suppliers can hold back power, leading to highly variable "spot pricing" during times of high load. Therefore, electric power deregulation is a two-sided issue: it concerns both the generation and the transmission of electricity.

One problem that unbundling transmission and generation has produced is the increased overload of certain transmission corridors. Like highways during rush hour, transmission lines are also susceptible to congestion and overload.

Before deregulation, when generation and transmission were jointly controlled, generation was decreased at one site and increased at another to load alternate transmission paths. This relieved the congestion.

Nowadays, however, the electricity suppliers do not always cooperate with transmission providers to balance the power flow across the system. Contracts between supplies and customers typically specify a single contract path along which the contracted amount of power will flow. The transmission provider—along which the contract path occurs—approves this path.

In reality, however, power flows across the path of least impedance. The power may actually flow over a collection of parallel paths to its destination. This can cause overloads on transmission lines covering large geographic areas. These overloads are very difficult to predict and control.

Systems that suffer from severe congestion are said to be *transmission limited* and are susceptible to cascading failures. On the other hand, systems that do not have sufficient generation are said to be *generation limited*. This is partially the cause of the difficulties encountered by the state of California in 1999 and 2000.

California was one of the first states to fully embark on a deregulated electricity market. The state government took a very assertive stance. To encourage competition and the emergence of new generation suppliers, the California State's legislature forced the existing California utilities to sell off their generation assets. The Legislature's intent was to force the utilities to purchase their power on the spot market so that, in theory, they would always be able to get the best deal and the cheapest power.

No long-term contracts were permitted because the California Public Utilities Commission feared that consumers would be hurt if the prices dropped in a year or two. Unfortunately, the daily power purchases subjected utilities to the volatility of the marketplace. The "last minute" market gave power producers an incentive to withhold power, creating a buying frenzy, and prices rocketed upward.

As a result, California consumers paid $10.9 billion dollars more for electricity in 2000 than in the previous year.

Further aggravating this situation was legislation requiring that utilities use available state-based alternate energy, or "green power," often at much higher prices than traditionally produced power. Southern California Edison has paid $25 billion more for electricity under alternative energy contracts over the lifetime of this legislation.

But perhaps the fatal nail in the coffin was the rate cap placed by the legislators on the amount utilities could charge. Immediately prior to the enactment of the deregulation legislation, the California legislature rolled the price of electricity for the state's consumers back by 10% and froze it. Almost immediately, the price of natural gas and oil rose as a result of shortages. This move lead to increased wholesale electricity prices. But because of the price roll backs, utilities couldn't increase what they charged consumers high enough to recoup their expenditures. So both the consumers and the utilities suffered. As a result, the two largest California utilities, PG&E and Southern Cal Edison, are in the hole by $9.5 billion worth of power that they purchased. It will be many years before they are economically secure again.

What can other states learn from California's mistakes? While no one has all of the answers, there are a few guidelines that appear to make sense. Firstly, long-term contracts must be allowed to reduce unscrupulous price gouging on the spot market. In New England, at least 80% of the electricity bought and sold is arranged for in advance. The remaining 20% is purchased on the spot market. This minimizes the risk to the consumer, but also allows the utilities to take advantage of lower prices when possible. Secondly, utilities must be allowed to purchase power from the cheapest sources, and then pass those savings on to their customers. Conversely, if the price of electricity increases, that cost increase must also be passed on to consumers. In short, the state of California did not allow the principles of supply and demand to take hold. Deregulation has the potential to bring savings to consumers nationwide—if allowed to progress unfettered by legislative restrictions.

About the author

Mariesa L. Crow is the Vice President for Industry/Education Relations of the IEEE Power Engineering Society. She is a Registered Professional Engineer in the State of Missouri. She is currently a professor of Electrical and Computer Engineering at the University of Missouri–Rolla and the Associate Dean for Research and Graduate Affairs in the School of Engineering. She has authored over 60 articles and has participated in research projects totaling over $6 million in the past 10 years. She received one of the IEEE Third Millennium Medals in 2000.